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(PTCC )

°C

°C

(TEM)

(SEM)

nm

\*



PTCC 1187

°C

)

( PTCC

°C

(OD ) nm

( )

/ ( )

°C

[ ]

)

°C

(

°C

nm

( )

( ) (CaCl<sub>2</sub>)

mmol

°C

mmol ( )

mmol

°C

( ) (G<sub>2</sub>P)

[ ]

mmol

( )

°C

<sup>21</sup> Serratia marcescens

<sup>25</sup> Para-nitro Phenyl Phosphate

<sup>29</sup> Phosphatase Enzyme Activity Index

<sup>33</sup> TRIS Buffer

<sup>37</sup> Centrifuge

<sup>22</sup> Persian Type Culture Collection

<sup>26</sup> Incubation

<sup>30</sup> Calcium Chloride

<sup>34</sup> Hydrochloric Acid

<sup>38</sup> Filter Paper

<sup>23</sup> Nutrient Broth

<sup>27</sup> Optical Density

<sup>31</sup> Tri-Sodium Citrate

<sup>35</sup> Suspension

<sup>39</sup> Calcination

<sup>24</sup> Pompei

<sup>28</sup> Spectrophotometer

<sup>32</sup> Glycerol 2-Phosphate

<sup>36</sup> Shaking

<sup>40</sup> Crystallinity

pH [ ] (TEM) (FTIR) (XRD) (SEM)

[ ]

[ ]

PTCC 1187

[ ]

[ ]

°C PTCC 1187

[ ]

[ ]

[ ] F (ASTM)

%

°C

<sup>41</sup> Autoclave  
<sup>44</sup> **T**ransmission **E**lectron **M**icroscopy  
<sup>47</sup> Pang and Bao  
<sup>50</sup> Extracellular Polymeric Matrix  
<sup>53</sup> Phases  
<sup>56</sup> **A**merican **S**tandard for **T**esting and **M**aterials

<sup>42</sup> **X**-**R**ay **D**iffraction  
<sup>45</sup> **F**ourier **T**ransform **I**nfrared **S**pectroscopy  
<sup>48</sup> Sata  
<sup>51</sup> Peak  
<sup>54</sup> Tri-Calcium Phosphate

<sup>43</sup> **S**canning **E**lectron **M**icroscopy  
<sup>46</sup> Williamson-Hall  
<sup>49</sup> Enterobacteriaceae  
<sup>52</sup> Thackray  
<sup>55</sup> Calcium Oxide



$$\varepsilon \quad . ( \quad )$$

$$Y = \frac{1}{X + \frac{\lambda}{d}} \quad ( [ \quad ] \quad )$$

°C

nm °C

$$X_c = -(V / I) \quad ( )$$

[ ] ( nm )

°C

I	V /	
/	/	/

°C

$$\begin{matrix} I & X_c \\ ( ) & V / ( ) \\ & ( ) \end{matrix}$$

( )

[ ]

)

cm<sup>-1</sup>) OH-

cm<sup>-1</sup>) PO<sub>4</sub><sup>3-</sup>

CO<sub>3</sub><sup>2-</sup>

HPO<sub>4</sub><sup>2-</sup>

$$B \cos\theta = \frac{1}{\lambda/d + \varepsilon \sin\theta} \quad ( )$$

B

$$d \left( \frac{1}{\text{nm}} \right) \quad \theta \quad \lambda$$

CO<sub>3</sub><sup>2-</sup>

] HPO<sub>4</sub><sup>2-</sup> ( )

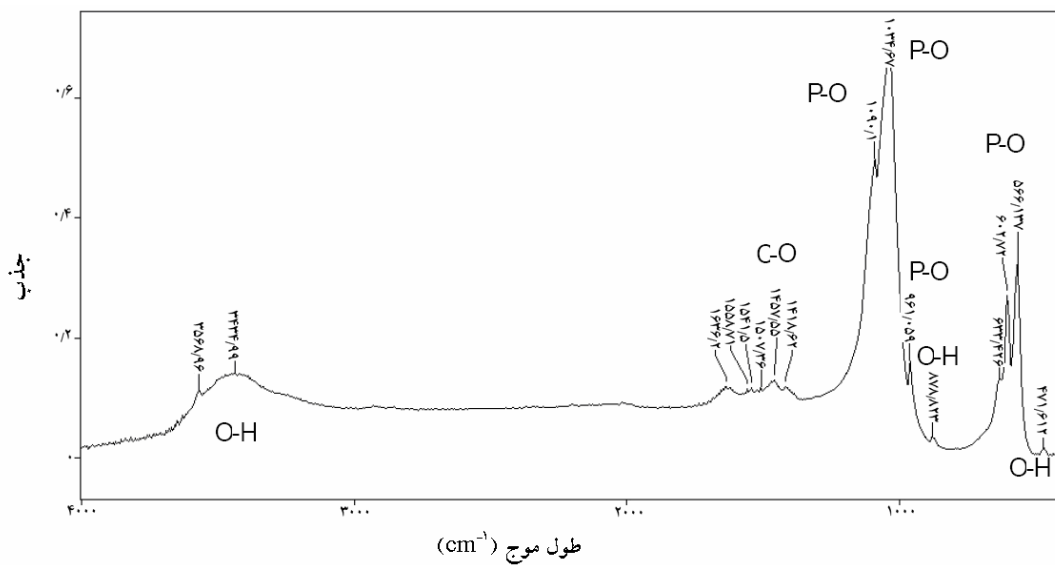
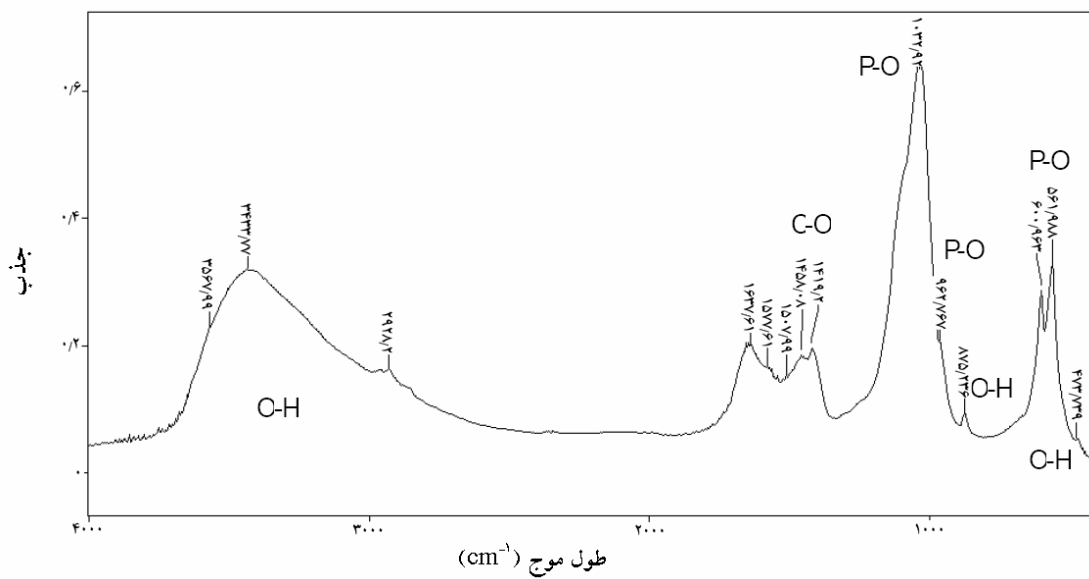
[

$$\begin{matrix} B & (( ) ( ) ( ) ) \\ \sin\theta & B \cos\theta \end{matrix}$$

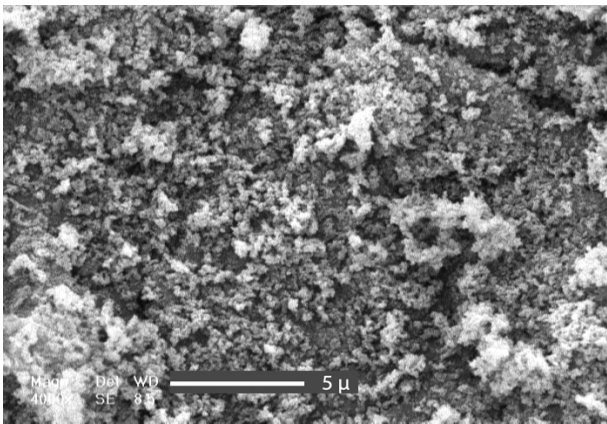
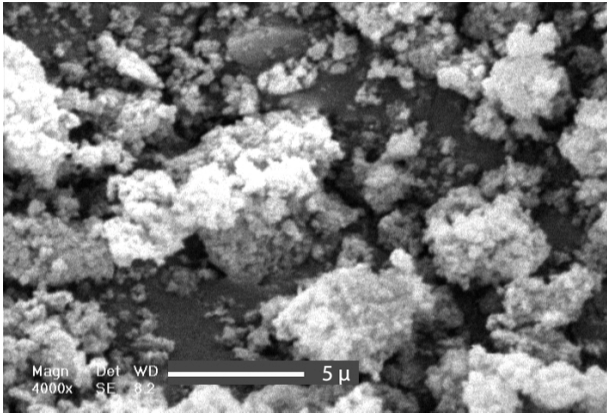
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:

	OH-	H2O	CO32-	PO43-			HPO42-	OH-	PO43	



°C



( )  
/ cm<sup>-1</sup> ( /

°C

°C

°C

°C

( )

°C

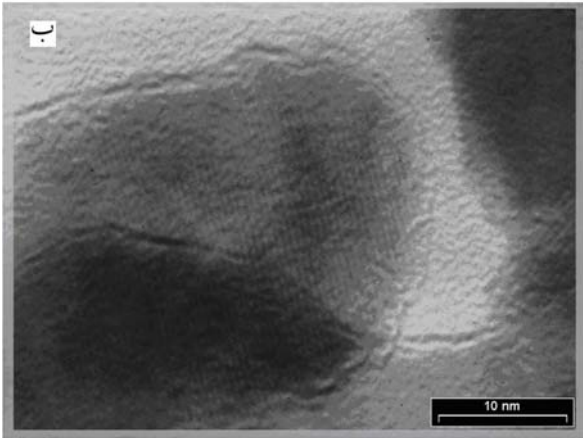
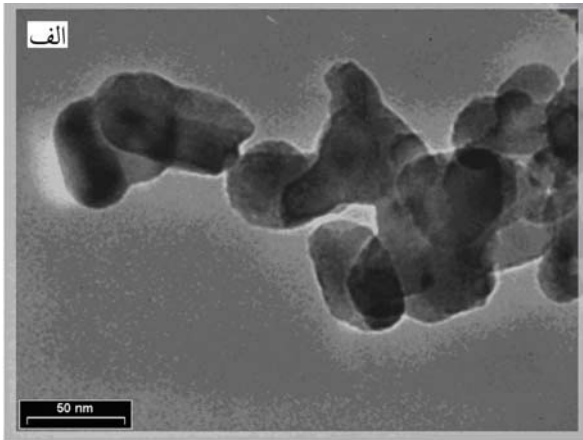
nm

μm

°C

( )





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[ ]

°C

[ ]

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